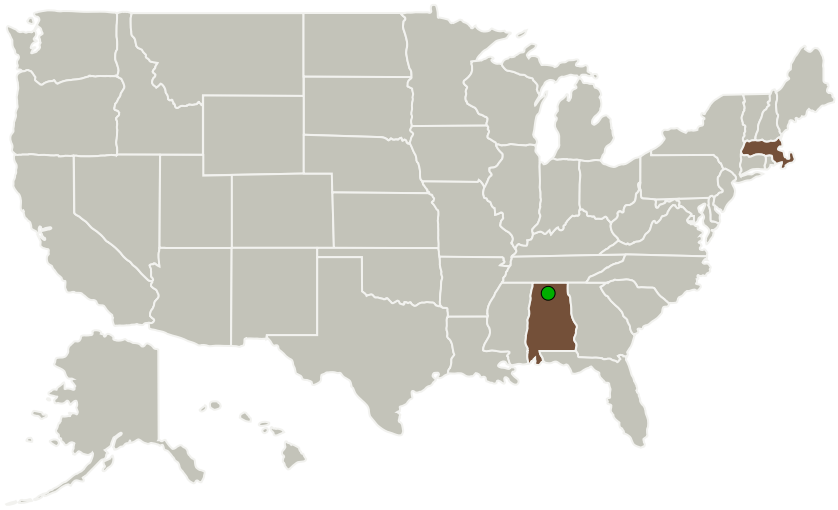
Oxygen Recovery From Carbon Dioxide Through Electrolysis, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Giner, Inc. proposes to demonstrate the feasibility of developing an improved electrochemical process for the removal CO2 from cabin air, while also providing for recycling of water and provision of O2. This new process seeks to more efficiently combine the current functions of standard water electrolysis for breathing O2 production and the Sabatier process for removal of cabin CO2. It represents a major innovation and paradigm shift, rather than a minor enhancement of existing processes. The process will be accomplished using a novel electrochemical CO2 reduction electrocatalyst in conjunction with a proton-exchange membrane electrochemical cell. This technology is expected to have direct applications for Human Exploration and Development of Space missions as a means for the management and removal of excess respired carbon dioxide space cabins and enhanced closed-loop operations on long duration missions. The proposed process will enhance the closed-loop by recycling considerable amounts of water and will provide launch-mass saving. The proposed process not only will reduce CO2, but will also produce water and organic fuel; the water will be electrolyzed to O2 and the liquid fuel of will be captured and stored for use. The Phase I technical objectives are to demonstrate the effectiveness of a novel specialty cathode catalyst for carbon dioxide reduction that results in the production of water and methanol, develop an efficient cathode electrode structure, fabricate a complete electrochemical reactor, and to operate the reactor under a wide variety of conditions. The Phase I concludes with a design for a complete, integrated system for oxygen generation and carbon dioxide and water recycling.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Giner, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

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Organizations Performing Work	Role	Type	Location
Giner, Inc.	Lead Organization	Industry	Newton, Massachusetts
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Massachusetts

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: Oxygen Recovery From Carbon Dioxide Through Electrolys is, Phase I Project Image

Closeout Documentation:
- Final Summary Chart Image*(https://techport.nasa.gov/file/139317)*

Images

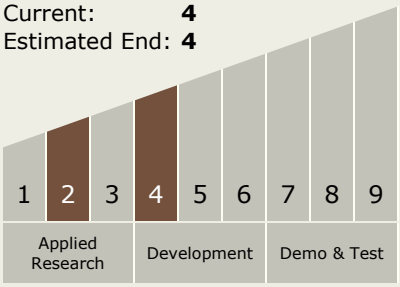
Briefing Chart Image
Oxygen Recovery From Carbon Dioxide Through Electrolysis, Phase I
(https://techport.nasa.gov/image/136789)

Project Management *(cont.)*

Principal Investigator:
Badawi M Dweik

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.1 Atmosphere Revitalization

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System